Small Business Innovation Research/Small Business Tech Transfer

Probabilistic Formulation of Multi-fidelity Aerodynamic Databases (ProForMA), Phase I

Completed Technology Project (2018 - 2019)

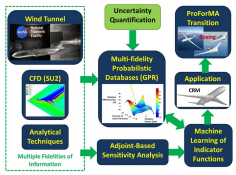
Project Introduction

The design of new aircraft involves understanding the flow physics around the configurations as well as their stability and control characteristics over the entire flight envelope. Such a coverage is extremely expensive if wind tunnel and flight tests are the primary means of understanding the aerodynamic characteristics. Hence, there has been a push towards use of simulations for understanding aerodynamics of airframes early in the design process. However, high-fidelity simulations can quickly become very expensive, so there is a need to create multi-fidelity databases for aerodynamic data. For this purpose, IAI proposes to develop probabilistic aerodynamic databases, that not only provide confidence on the fit, but also characterize the sources of uncertainty. Morever, adaptive design of experiments are performed for maximum efficiency in database creation. The proposed ProForMA tool can fill in a critical gap in design optimization and certification tools used by NASA and the industry

Anticipated Benefits

ProForMA addresses a critical need in NASA's repository of tools and techniques to develop unconventional aircraft. Several T&E efforts at NASA, have to bear exorbitant costs for fully testing new concepts. The proposed approach contributes to the state-of-the-art in T&E taking advantage of latest advances in HPC to alleviate costs. Benefits of this tool can be leveraged by all programs concerned with unconventional aircraft, such as AAVP, TACP, MUTT and ASE

Other government agencies, interested in unconventional aircraft, such as the Air Force, may use this tool for programs such as N-MAS and AAW or to reduce costs of T&E (AF T&E program). Navy's UCLASS program also stands to benefit from this. Boeing is already quite interested in this research and envisions a huge potential for ProForMA in understanding stability and control characteristics of new aircraft



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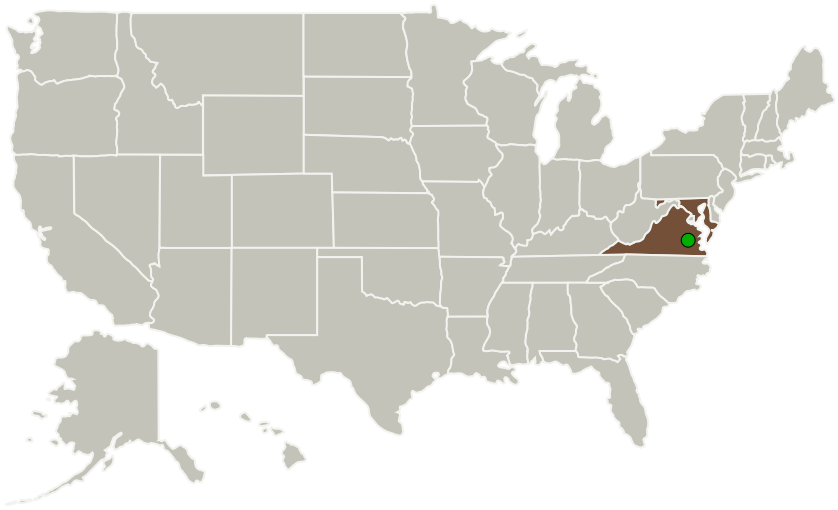
Primary U.S. Work Locations and Key Partners



Organizations Performing Work	Role	Type	Location
Intelligent Automation, Inc.	Lead Organization	Industry	Rockville, Maryland
Langley Research Center(LaRC)	Supporting Organization	NASA Center	Hampton, Virginia

Primary U.S. Work Locations	
Maryland	Virginia

Project Transitions

July 2018: Project Start

February 2019: Closed out

Closeout Documentation:

- Final Summary Chart*(https://techport.nasa.gov/file/141241)*

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

Intelligent Automation, Inc.

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Principal Investigator:

Nikhil Nigam

Co-Investigator:

Nikhil Nigam

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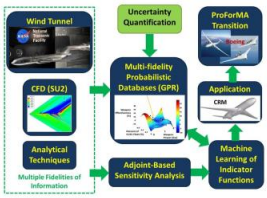
Images

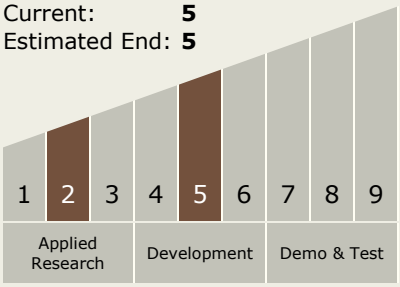
Briefing Chart Image
Probabilistic Formulation of Multi-fidelity Aerodynamic Databases (ProForMA), Phase I
(https://techport.nasa.gov/image/131143)



Final Summary Chart Image
Probabilistic Formulation of Multi-fidelity Aerodynamic Databases (ProForMA), Phase I
(https://techport.nasa.gov/image/131612)

Technology Maturity (TRL)

Start: **2**
Current: **5**
Estimated End: **5**



Technology Areas

Primary:

- TX15 Flight Vehicle Systems
  - TX15.1 Aerosciences
    - TX15.1.3 Aeroelasticity

Target Destination

Earth